

SCIENCE MISSION DIRECTORATE

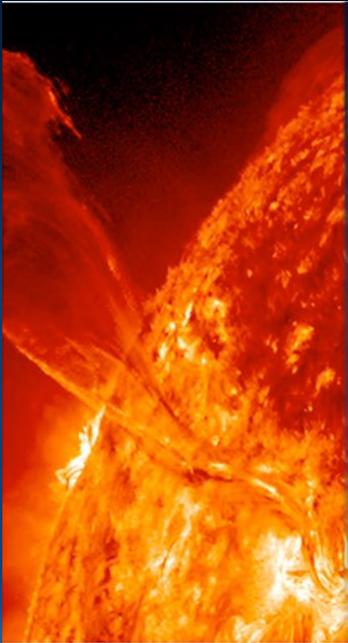
Dennis J. Andrucyk
Deputy Associate Administrator

September 20, 2017

The background of the slide is a composite image. At the top, a dark blue banner contains the text 'SCIENCE MISSION DIRECTORATE'. Below this, the name 'Dennis J. Andrucyk' and his title 'Deputy Associate Administrator' are displayed in orange text. The date 'September 20, 2017' is shown in white text. The main visual is a 3D rendering of the NICER (Neutron Star Interior Composition Explorer) satellite in space. The satellite is a complex structure with various instruments and solar panels. In the foreground, a large, multi-lens X-ray telescope is visible. The background features a vibrant, swirling nebula or accretion disk around a central bright source, with colors ranging from blue and purple to orange and red. The word 'NICER' is written in large, white, bold letters in the bottom left corner.

NICER

NASA SCIENCE MISSION DIRECTORATE



HELIOPHYSICS



EARTH SCIENCE



PLANETARY SCIENCE



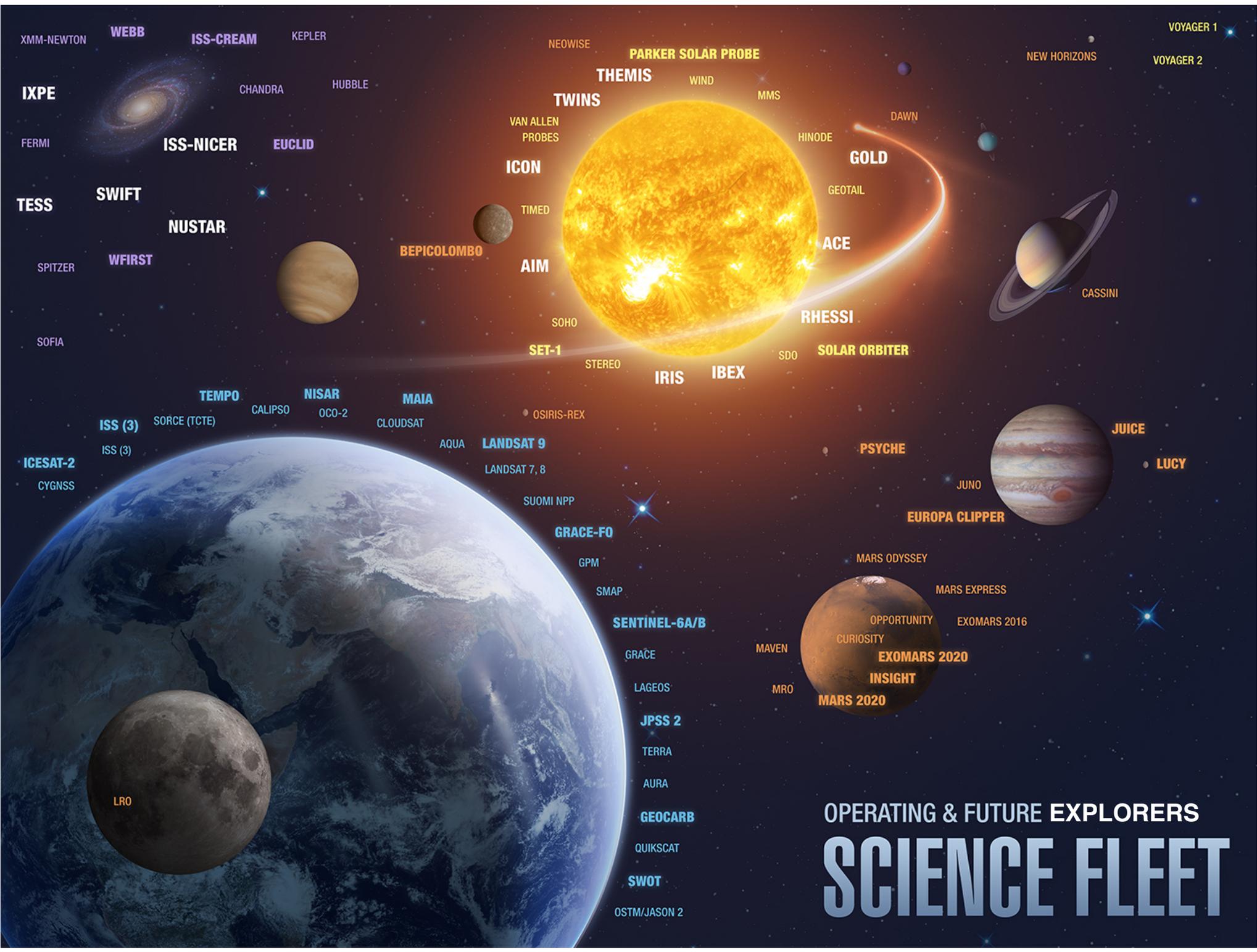
ASTROPHYSICS



JASD

Innovation & Discovery

An Integrated Program Enabling Great Science

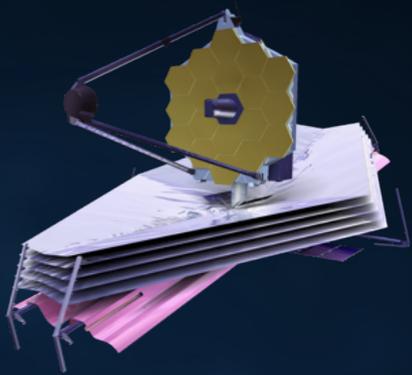


XMM-NEWTON WEBB ISS-CREAM KEPLER NEOWISE PARKER SOLAR PROBE VOYAGER 1
 IXPE CHANDRA HUBBLE TWINS THEMIS WIND MMS NEW HORIZONS VOYAGER 2
 FERMI ISS-NICER EUCLID VAN ALLEN PROBES HINODE DAWN GOLD
 TESS SWIFT NUSTAR ICON TIMED GEOTAIL ACE
 SPITZER WFIRST BEPICOLOMBO AIM SOHO RHESSI
 SOFIA SET-1 STEREO IRIS IBEX SDO SOLAR ORBITER CASSINI
 TEMPO NISAR MAIA OSIRIS-REX PSYCHE JUICE
 ISS (3) SORCE (TCTE) CALIPSO OCO-2 CLOUDSAT AQUA LANDSAT 9 LUCY
 ICESAT-2 ISS (3) LANDSAT 7, 8 JUNO EUROPA CLIPPER
 CYGNSS SUOMI NPP GRACE-FO GPM MARS ODYSSEY MARS EXPRESS
 SENTINEL-6A/B GRACE MAVEN MARS 2020
 LAGEOS JPSS 2 TERRA EXOMARS 2016
 AURA GEOCARB CURIOUSITY EXOMARS 2020
 QUIKSCAT INSIGHT
 SWOT MARS 2020
 OSTM/JASON 2

OPERATING & FUTURE EXPLORERS
SCIENCE FLEET

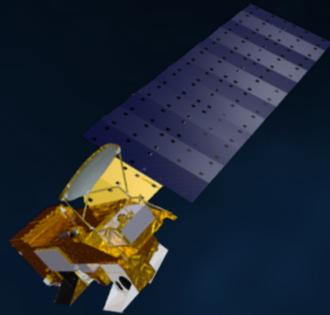
EXPLORERS AND THE SMD PORTFOLIO

FLAGSHIP CLASS



- High priority
- Very high significance
- High complexity
- Long mission lifetime
- High cost
- Critical launch constraints
- No in-flight maintenance
- No re-flight opportunities

LARGE CLASS



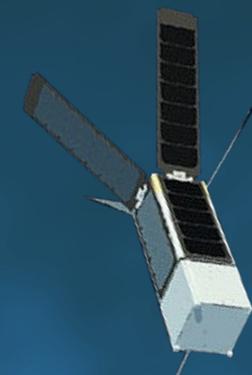
- High priority
- High significance
- High to medium complexity
- Medium mission lifetime
- High to medium cost
- Medium launch constraints
- Difficult in-flight maintenance
- Few or no re-flight opportunities

MEDIUM CLASS



- Medium priority
- Medium significance
- Medium to low complexity
- Short mission lifetime
- Medium to low cost
- Few launch constraints
- May have in-flight maintenance
- Some or few re-flight opportunities

SMALLSAT/ CUBESAT



- Low priority
- Low to medium significance
- Short mission lifetime
- Medium / low complexity
- Low cost
- Few to no launch constraints
- Planned in-flight maintenance
- Re-flight opportunities

EXPLORERS AND THE SMD PORTFOLIO

Medium Class (MIDEX)



ICON

- Investigations characterized by definition, development, mission operations, and data analysis costs under \$180 to \$200 million to NASA
- In Development:
 - ICON, TESS
- Operational:
 - ACE, Swift, THEMIS

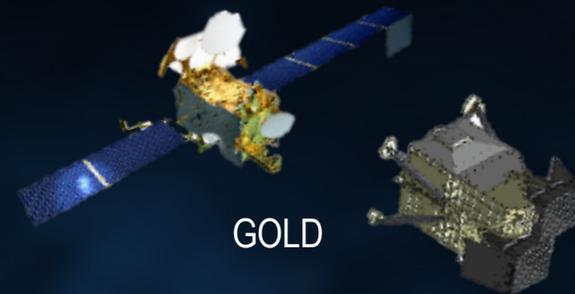
Small Explorers (SMEX)



IXPE

- Investigations characterized by definition, development, mission operations, and data analysis costs under \$120 million to NASA
- In Development:
 - IXPE
- Operational:
 - AIM, IBEX, IRIS, NuSTAR, RHESSI

Universities, Internationals, Missions Of Opportunities



GOLD

University-Class Explorers (UNEX)

- Investigations characterized by definition, development, mission operations, and data analysis costs under \$15M (real year dollars) to NASA, launched in low cost methods

Missions of Opportunity (MO)

- Investigations characterized by being part of a non-NASA space mission and having a total NASA cost under \$55M
- Conducted on a no-exchange-of-funds basis with the organization sponsoring the mission
- In Development: GOLD, NICER

Internationals

- Operational Missions: INTEGRAL

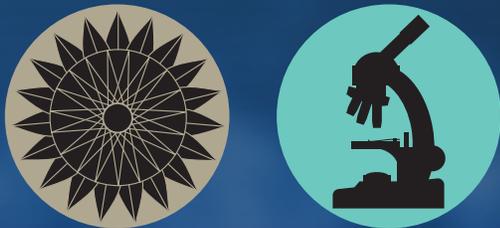
ROLE OF TECHNOLOGICAL INNOVATION

- SMD's goal is to raise the bar on scientific discovery: Identify a larger number of technologies of high mission impact and put them into space
- Collaboration with NASA Centers, along with commercial and academic partners, is key to achieve this goal

ENHANCED TECH INFUSION

TRL 3-5

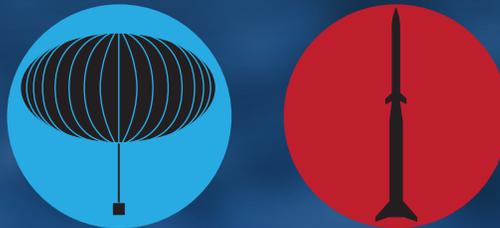
SMD Technology Programs



Coordination with STMD Game-Changing Development (GCD) Program

TRL 5-8

Ground, Suborbital & In-Space Validation



Coordination with STMD Technology Demonstration Mission (TDM) Program

TRL 6-9

Announcements of Opportunity



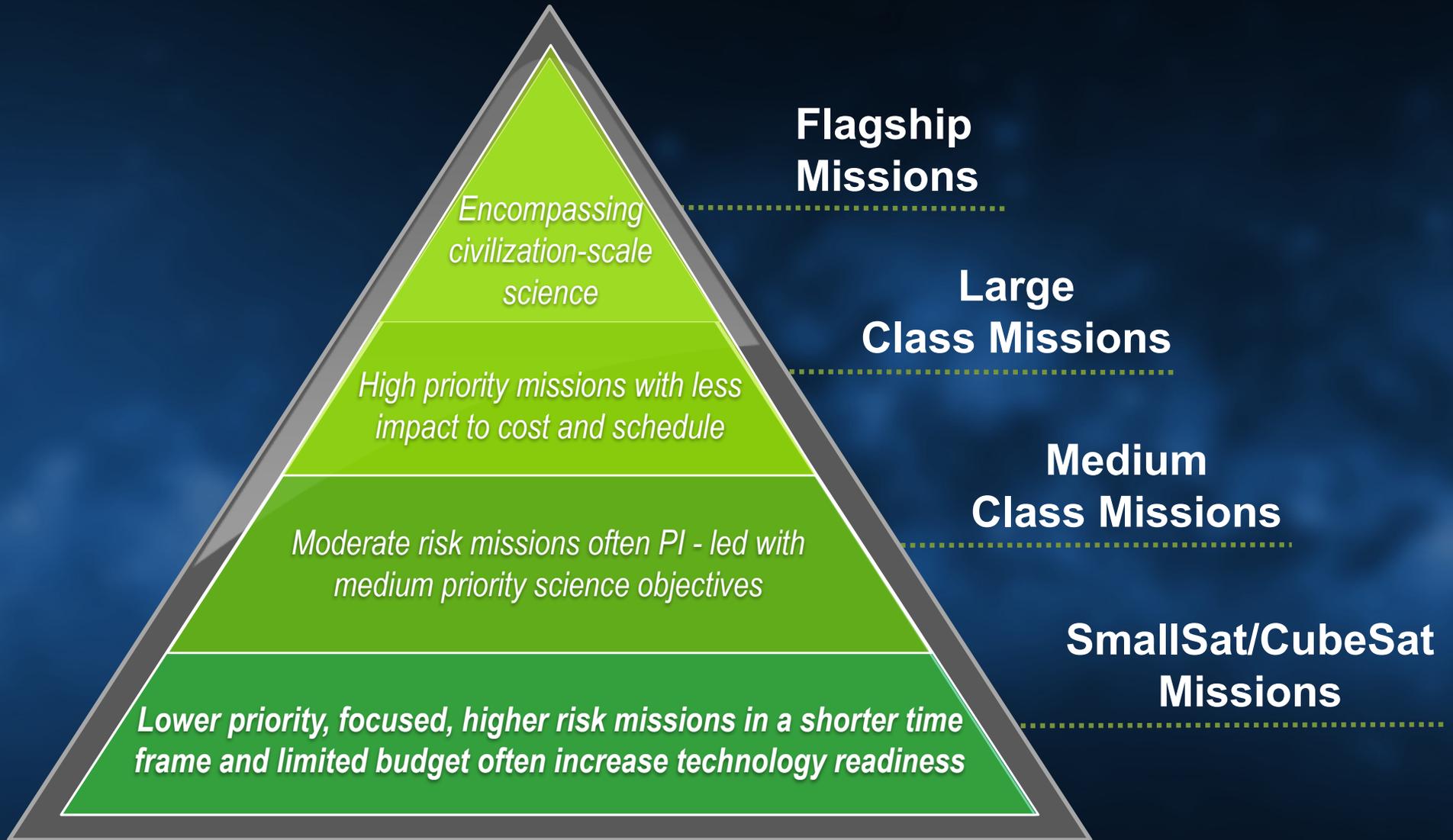
+ Enhanced technology demonstrations
+ Increased technology infusions
+ Expanded rideshare opportunities

SMD TECHNOLOGY RELATED EMPHASES

- Utilize AOs and SMD missions proactively for technology infusion and flight
- Prioritize technologies of high impact for the SMD portfolio
- Measure needs, impact and effectiveness of our technology investments, and pivot where needed

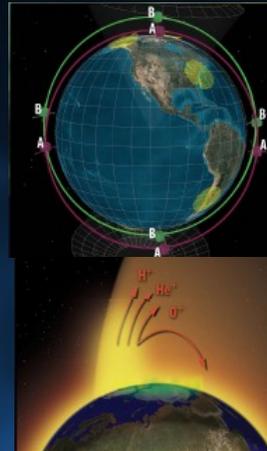
BACKUP

THE VALUE OF A BALANCED SMD PORTFOLIO

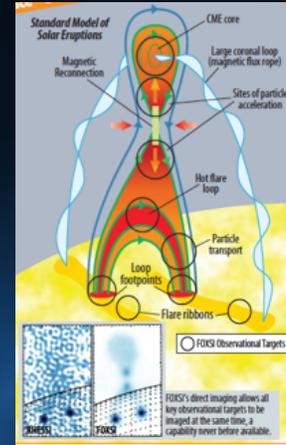


AO 2016 SMEX SELECTIONS [1/2]

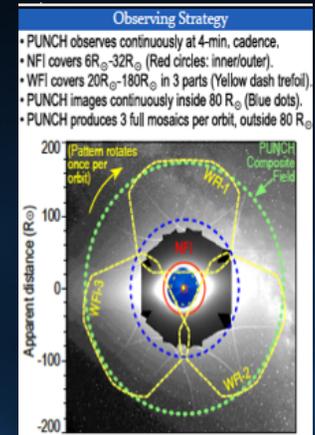
- Five SMEX missions in Phase A Competition, LRD ~ 2022
 - Meme-x
 - Foxsi
 - Muse
 - Tracers
 - Punch
- Two SMEX selections and one MO selection develop space weather techniques directly applicable to space weather capabilities



MEME-X
Mechanisms of Energetic Mass Ejection eXplorer



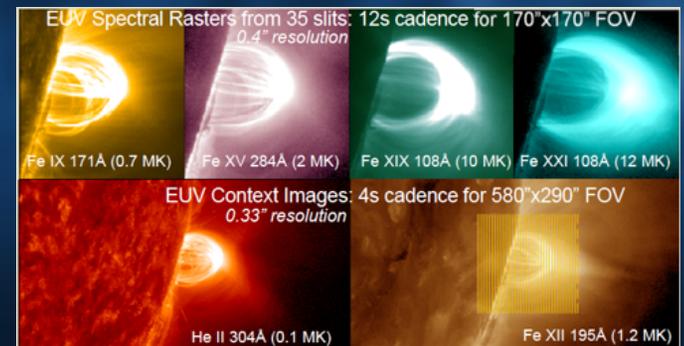
FOXSI
Focusing Optics X-ray Solar Imager



PUNCH
Polarimeter to Unify the Corona and Heliosphere



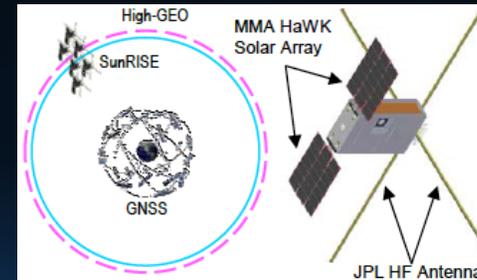
TRACERS
Tandem Reconnection and Cusp Electrodynamics Reconnaissance Satellites



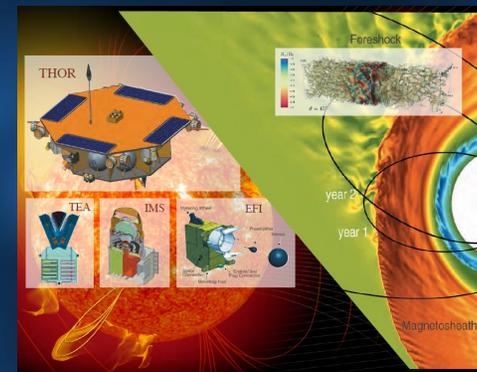
MUSE
Multi-slit Solar Explorer

AO 2016 SMEX SELECTIONS [2/2]

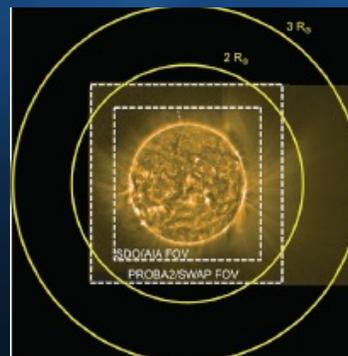
- Three MOs selected to proceed
 - Two MOs (SunRISE, AWE) in Phase A Competition, LRD varies
 - One partner MoO: THOR-US, contingent on selection of ESA M5 mission
- Tech development funding for Cat-3 MO: COSIE
- Several selections use multiple CubeSats/SmallSats
 - Technology development that can be leveraged for future Decadal Survey missions



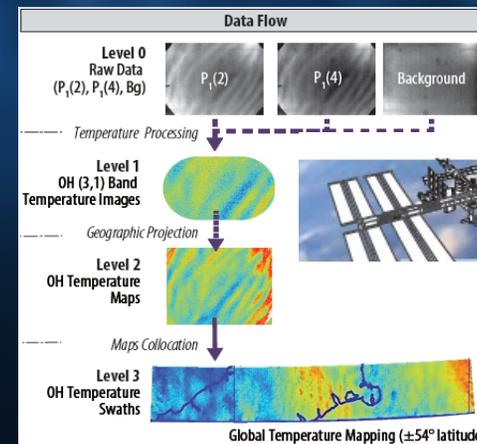
SunRISE
Sun Radio Interferometer Space Experiment



THOR-US
Turbulence Heating Observer



COSIE
Coronal Spectrographic Imager in the EUV



AWE
Atmospheric Waves Experiment